

<p><b>2003-879146/82</b>      <b>E17 H02</b>      <b>BADI 2002.04.30</b>  <b>BASF AG</b>      <b>*DE 10219375-A1</b>  2002.04.30 2002-1019375(+2002DE-1019375) (2003.11.13) C07C  7/08, 11/08</p> <p><b>Butene recovery from C4 fractions by continuous extractive distillation involves washing and de-gassing stages with liquid draw-off during de-gassing such that energy demand is minimized</b>  <b>C2003-248792</b>  Addnl. Data: TILL A, HEIDA B, KINDLER K</p>	<p><b>E(10-J2C3, 11-Q1) H(2-A4)</b></p>
<p><u><b>NOVELTY</b></u>  Continuous extractive distillation using a selective solvent (LM) to recover butenes from a C4 cut containing butane, butenes and other 3-5C hydrocarbons involves a washing stage (E), followed by a de-gassing stage (A), a liquid being drawn off in stage (A) and heated and recycled, with the initial drawing off being at the separation stage requiring the minimum energy expenditure in stages A and E.</p> <p><u><b>DETAILED DESCRIPTION</b></u>  Continuous extractive distillation using a selective solvent (LM) to recover butenes from a C4 cut containing butane, butenes and other 3-5C hydrocarbons involves a washing stage (E), followed by a de-gassing stage (A). Stage E involves feeding the C4 gas cut from</p>	<p>below and the LM liquid from above to separate the cut into a butane-containing top stream (C<sub>4</sub>H<sub>10</sub>) and a sump stream (LM/C<sub>4</sub>H<sub>8</sub>) comprising LM loaded with butene and optionally also traces of other hydrocarbons. Sump stream (LM/C<sub>4</sub>H<sub>8</sub>) is fed to stage A to which is fed energy via a sump evaporator (W5), the stream being separated at increased temperature and optionally also reduced pressure with respect to stage E into a top stream (C<sub>4</sub>H<sub>8</sub>) containing butenes and optionally also traces of other hydrocarbons and a solvent-containing sump stream (LM), the heat in the sump stream being used to raise the temperature in stage A. The novel feature is that a liquid is drawn off from the separation stage(s) below the introduction of the sump stream (LM/C<sub>4</sub>H<sub>8</sub>) from stage (E), this stream being warmed and/or evaporated by indirect heat exchange with the sump stream (LM) from stage (A) and recycled to stage (A) and the initial drawing off being at the separation stage requiring the minimum energy expenditure in stages A and E.</p> <p><u><b>USE</b></u>  None given in the specification.</p> <p><b>DE 10219375-A+</b></p>

### ADVANTAGE

Efficient process with minimal energy and investment demands.

### DESCRIPTION OF DRAWING

The drawing shows a 2-column embodiment of a process for extractive distillation recovery of butenes from a C4 cut.

washing column E  
de-gassing column A  
extractive solvent LM  
condensor W2  
heat-exchanger W3  
sump evaporator W5

### EXAMPLE

In a butene separation process involving a washing as well as a degassing stage, the energy requirements in megawatts were 10.7, 7.0, 6.2 and 6.4 respectively when streams were drawn off from the first second, third and fourth theoretical stages in the de-gassing zone (A), heated by the solvent LM and recycled in each case back to the separation stage from which it had originally been drawn off. The solvent was N-methylpyrrolidone (91.7%) and water (8.3%); the feed

(13,666kg/hour) contained, inter alia, n-butene (27.8%) and i-butene (33.8%); the 30 theoretical plate washing stage (E) was operated with the C4 stream entering at the 9th bottom plate at 41.7°C and the solvent at the 3rd plate at 34°C, the column head pressure being 4.05 bar. The butene-loaded solvent stream (LM/C<sub>4</sub>H<sub>8</sub>) entered the de-gassing column (A) at the 4th top plate at 55.4°C.

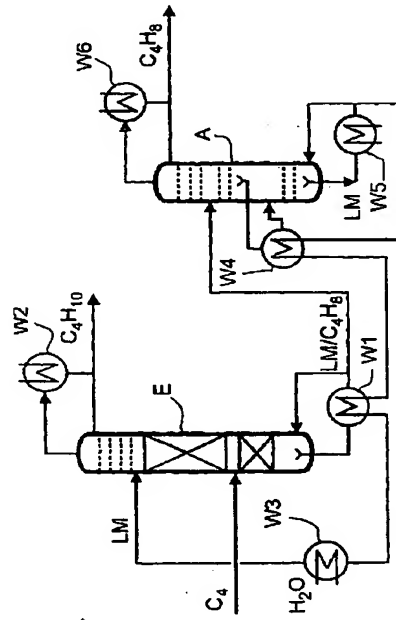
### TECHNOLOGY FOCUS

Chemical Engineering - Preferred Materials : The feed to stage E is (i) a C4 cut from an FCC cracker containing by wt butanes (20-70, especially 42, %); butenes (30-80, especially 56, %); and other hydrocarbons (balance, especially 2, %) or (ii) an untreated raffinate from a butadiene plant. The selective solvent (LM) is N-methylpyrrolidone (NMP), dimethylformamide, acetonitrile and/or furfural, optionally together with a co-solvent, especially NMP with 0-20 (especially 8.3) wt.% water. Preferred Process : Recycling of the stream in stage A is via the separation stage used for its drawing-off. This drawn-off stream is flash evaporated to give a vapor and a liquid phase, these phases being recycled at the same stage or the vapor phase being fed to the stage above that at which the liquid phase is drawn off. Stages A and E can be in separate columns or the same

DE 10219375-A+1

2003-879146/82

column, with the number of theoretical stages in E being 10-80 (especially 26) and in A being 1-30 (especially 4).



(9pp1958DwgNo.1/2)

DE 10219375-A/2